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PROGRESS REPORT OF THE COMMITTEE ON SANITARY DRINKING FOUNTAINS¹

In response to the active popular demand a large number of manufacturers are now offering for sale so-called sanitary drinking fountains. This means that a very wide variety of types of fountains is now available. In any town or city many different types will probably be found. In a recent investigation at the University of Minnesota out of 77 drinking fountains 15 different types were found. Two general classes of fountains are now on the market, the intermittent flow type and the continuous flow type. Each of these general classes may again be subdivided into two subclasses: those with suitable mouth guards and those without suitable mouth guards.

Most of the fountains now available seem to have been designed with reference to appearance rather than to the laws of sanitary science. Although many of the fountains are extremely neat and attractive in appearance, nevertheless with a little thought they will be found to provide small security against the transmission of contagious diseases. Some of the fundamental principles which most fountains violate are as follows:

First, the fountain should be so designed that the lips of the drinker may not touch the metal top of the bubbler. In spite of this self-evident fact, it was discovered last year in a canvass of the catalogs of 39 manufacturers that only 6 of them appreciated the importance of this detail, since only 6 of these 39 provided suitable mouth guards for all of their fountains.

In order to demonstrate the need of mouth guards, your committee employed an observer to inspect the use made of two fountains without mouth guards. One fountain was of the continuous flow type with a bubble $\frac{5}{8}$ inch in height. It was located in a public library. During the period of observation 59 persons drank from the fountain, 22 of whom were children, and 37 adults. Of the 22 children, 15 placed their lips upon the metal top of the bubbler in

¹ Read before the Iowa Section at its annual meeting, October 10-12, 1917, at Council Bluffs.

drinking, while 7 did not. Of the 37 adults, 28 placed their lips upon the metal top, while only 9 did not. One adult had an eruption upon the face, and one was apparently in bad general health.

The second fountain was of the intermittent flow type with a bubble $\frac{3}{4}$ inch in height. It was located at a street corner. During the period of the observation 43 persons drank. One was a small child that had to be held up in order to drink. This child placed its lips upon the metal top of the bubbler. Of the remaining 42 persons, 18 were children, and 24 adults. Ten of the 18 children placed their lips upon the metal top, while 8 did not. One of these children was apparently in bad general health. Nine of the 24 adults placed their lips upon the metal top, while 15 did not.

Such facts are conclusive evidence of the need of mouth guards. Any observer may easily obtain his own evidence of this need by watching the use made of fountains without mouth guards in his own town.

Second, no fountain should be so designed that the incoming bubble of water passes through a cup of contaminated water which cannot drain out. Many of the new drinking fountains in the State of Iowa are of this type. Actual experiment has found that when coloring matter is added to these cups, it is retained for long periods of time before the fresh bubble passing up through the cup of water has removed all of the stain. Of course the bacteria from the lips of the drinker may readily fall back with the escaping water into the cup and seriously contaminate it. Such a contamination would exist for a long period of time before all traces of it had disappeared.

Third, in the case of bubble fountains without mouth guards no effort seems to be exerted to maintain a height of bubble sufficient to permit easy drinking without resting the lips directly upon the metal top of the bubbler. This is usually the fault of the owner of the bubbler and not of the manufacturer. It may, however, be the fault of the manufacturer in case he has not provided a pressure regulator which is so designed that an ample height of bubble will be maintained for ordinary variations in pressure in the service pipe of the fountain. This is an especially important point in the case of school buildings where at recess times or between classes large numbers of fountains are in use at the same time. This lowers the pressure in the service pipes considerably and a well designed pressure regulator on each fountain becomes an absolute necessity.

Fourth, fountains should be so designed that the water which

has touched the lips of the drinker cannot be retained by the fountain long enough to endanger the next drinker. With the present vertical jet type of fountain, if it is designed upon the intermittent flow principle, when the flow is stopped after a drinker is through, the water in contact with the lips falls back upon the top of the bubbler. If the bubbler is then in the act of draining out, some of the contaminated water may be drawn within the bubbler itself. In any case, it runs over the surface of the bubbler, making it possible to deposit thereon disease germs or particles of mucous membrane. In the case of vertical jet fountains, designed upon the continuous flow principle, it would seem at first thought that no danger of this kind would exist. Of course such a fountain, if it had an undrained cup, might violate the second principle of design noted above and be a continual source of danger.

The following question, however, is not yet satisfactorily answered: Is a properly designed, continuous flow, vertical jet fountain dangerous, and if so, why? Experiments upon such a fountain, made in the laboratory of medical bacteriology at the University of Wisconsin in 1915 shows real danger. The bubbler tested was an ordinary continuous flow type, consisting of a perforated top which screwed into the center of a hollow metal bulb. The experimenters washed out their mouths with suspensions of *B. prodigiosus*, and then without touching the metal portions of the fountain, drank from a bubble 2 to 3 cm. in height. In one case the bacterium thus introduced was recovered after one hundred and thirty-five minutes. The average maximum length of time which the bubble retained the organisms was twenty-five minutes. The reason why these organisms were retained for so long a time has not been demonstrated. The theory has been propounded that these organisms danced upon the column of water much as a ball dances upon the top of a garden fountain. It seems to your committee that more experimental evidence is necessary in order to show that the continuous flow, vertical jet type of fountain, if properly designed, is so dangerous as this one set of experiments seems to prove. Accordingly your committee would ask that it be continued another year in the hope that it may find the time to conduct a series of experiments along this line.

So far as your committee is aware only 4 manufacturers have as yet realized the dangers lurking in the vertical jet type of fountain. Within the past few weeks one of these manufacturers has placed

upon the market a new type of nozzle. This nozzle throws a jet at a slant and the nozzle itself is so protected that it cannot be contaminated. The nozzle is designed after the drawing by H. A. Whittaker, Director, Division of Sanitation, Minnesota State Board of Health, published in the Public Health Reports, vol. 32, no. 19, p. 695, May 11, 1917.

The laboratory investigations thus far have all shown the inherent danger of the vertical type of bubbler. The experiments at the University of Wisconsin on one occasion showed 43 out of 77 bubble fountains, or 55.8 per cent, to be contaminated with streptococci. On a second occasion 35 out of 50 fountains were found to be contaminated with streptococci, 70 per cent of the total. The immediate occasion for starting these investigations at the University of Wisconsin was an epidemic of streptococcus tonsillitis which occurred in the fall of 1914 in one of the women's dormitories. In seeking to find the source of the spread of this epidemic the drinking fountains were examined and found to be heavily contaminated with streptococci. Similar investigations at the University of Minnesota found that of the 77 drinking fountains in use 80 per cent were infected with streptococci.

A bibliography is appended to this report, giving all the references to papers on sanitary drinking fountains with which your committee is acquainted.

Conclusions. First, all drinking fountains should have suitable mouth guards. Second, sanitary fountains of the intermittent flow type with the vertical jet are unqualifiedly condemned. Third, sanitary drinking fountains of the continuous type, with a vertical jet, even when properly designed, would seem to be possible factors in the spread of contagious disease, if the Wisconsin laboratory experiments are confirmed by further tests. Fourth, the slanting jet type of fountain with the nozzle properly protected is perfectly safe, simple in design, and inexpensive to purchase. A design is already on the market which may be attached to any of the present type of drinking fountains. Fifth, your committee asks to be continued in order that it may make further investigations, particularly with reference to continuous flow bubblers of the vertical type.

Respectfully submitted,

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